

Refereed Conference paper

Web 2.0 Design Patterns Revisited: New Trends and their Implicit Pitfalls

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Web 2.0 brings new hype in the Internet business. Many traditional software companies are challenged by Web 2.0. Web 2.0 is viewed as a list of new design patterns in the emerging new Internet technologies and business models. In this paper, the author gives a new analysis on the Web 2.0 key aspects. This analysis is based on the observation that many Web 2.0 paradigms need careful consideration because they have implicit constraints and limited applicability. The author makes in-depth discussion how these implicit constraints are applied to the popular Web 2.0 concepts. Also, the author gives a new view on the groupware and networked research with the awareness of Web 2.0 trends. The new research issues in the research domain to fulfill the gap to the Web 2.0-capable world are discussed.

1. Introduction

Web 2.0 was proposed by O'Reilly in 2004. This was an interesting opportunity to identify new issues in the Internet age. After the dot-com bubble burst, many people believed that the Internet business was hype. Many people especially engaged in the service development lost their confidence. However, the emergence of Google changed the atmosphere. Then, the new perspective Web 2.0 emerged. This aroused the business development minds again. The concrete meaning of Web 2.0 was unclear, however, it was crucial to energize IT-related entrepreneurs with a new mindset. It is interesting that Web 2.0 means different things to the different people. We witness many Web 2.0 analyses from many camps in these two years. O'Reilly identifies 7 aspects of Web 2.0: (a) Folksonomy, (b) Rich User Experiences, (c) User as contributors, (d) Long tail, (e) Participation, (f) Radical Trust, and (g) Radical Decentralization. Gartner group identifies relatively independent 3 dimensions in Web 2.0: (a) Platform and architecture, (b) Community and collaboration, and (c) business model and process. In this paper, the author tries to identify the underlying implications of Web 2.0 from the analysis of legacy economics.

2. Research Purpose

It is interesting that there were not many papers on the Web 2.0-based computing discussed in the groupware and networked services research field even though Web 2.0 created a significant hype in the Internet-related industry. The author aims at identifying the Web 2.0 in the groupware and networked services framework. Especially, the author pursues a framework model to measure Web 2.0 applicability in the networked services.

3. Related Studies

Web 2.0 created a new hype cycle since it was coined in 2004¹⁾. It brought a wave of new discussions on the current web development. A services science discipline was discussed by Chesbrough et al²⁾. Wehr created Web 2.0 bingo³⁾ as a criticism of meaningless buzzword discussion. Treese discussed the returned hype⁴⁾. He mentioned that the reality was the continuous evolution of ideas and exploratory innovations even with much AJAX hype. Millen discussed social bookmarking from an enterprise viewpoint⁵⁾. Grudin suggested the importance of size transition to high-light development and research context⁶⁾.

4. Web 2.0

The transition from Web 1.0 to Web 2.0 was characterized by O'Reilly, outlined in **Table 1** with famous company names, concept names, service names and technology names.

This transition patterns excited many start-

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Table 1 Web 1.0 and Web 2.0¹⁾

Web 1.0	Web 2.0
DoubleClick	Google AdSense
Ofoto	Flickr
Akamai	BitTorrent
mp3.com	Napster
BritannicaOnline	Wikipedia
personal websites	blogging
evite	upcoming.org, EVDB
domain name	search engine
-speculation	-optimization
page views	cost per click
screen scraping	web services
publishing	participation
content management systems	wikis
directories (taxonomy)	Tag(“folksonomy”)
stickiness	syndication

Table 2 Design Patterns¹⁾

Design Patterns	Emphasis
The Web as Platform	platform rather than applications
Harnessing Collective	social
- Intelligence	content development
Data is the Next	competence is in data
- Intel Inside	not software
End of the Software	new software business
- Release Cycle	model needed
Lightweight	new development
- Programming Models	process model needed
Software Above the Level	diversity
- of a Single Device	needed
Rich User Experiences	Intuitive
	Manipulation of data

Table 3 Major Web 2.0 components

Web 2.0 components	examples
Folksonomy	Flickr, RSS feeding
Rich User Experiences	AJAX, Googlemap
User as a contributor	PageRank, user rating in eBay, Amazon review
Long tail	Google Adsense
Participation	blogging, SNS
Radical Trust	Wikipedia
Radical Decentralization	BitTorrent

up people who were discouraged during the dot-com bubble burst. It appeared that the new wave was coming. O’Reilly showed the new business model development patterns to stimulate the entrepreneur’s minds. The design patterns in Web 2.0 are shown in **Table 2**.

The typical Web 2.0 components and examples are shown in **Table 3**.

When we give an in-depth analysis on these Web 2.0 phenomenon, it is interesting that the typical Web 2.0 company Google does not make any particular social or collaborative characteristics. In other words, Google is just one of advanced network business companies.

When a venture company is asked about its business model, there could be two answers: (a) advertisement, or (b) nothing. In the later case, they want to be acquired by some company. It should be noted that the advertisement is an area with advantages of a large established big Internet companies.

Google is a new emerging company symbol with a new trend like Web 2.0. It has a unique technical advantage like PageRank, and an excellent in business models like Google AdWords. We can talk about AJAX-based applications like Google Earth. However, the author takes a new perspective that we did not think about in computer engineering for decades. Google has the most powerful computer in the world. Google builds up a large parallel computer from commodity computers with a fault-tolerant distributed algorithm. If the software produces a significant result, the delivering the most powerful computer makes sense. In the past days, the most powerful computers in the world did not produce the most profitable result in the world. Google changed it. Knowledge is the ultimate asset in the human society. Before Google, to refine knowledge was a human work with time-consuming efforts.

It is interesting that Web 2.0 was cited as design patterns. The past decade refinement of the Internet on this planet led to the level that each component was well refined to the level that the design pattern becomes more crucial than the component building-up. It is a major stride for the future.

5. Fits between Web 2.0 competence list with the groupware research literature

The metrics to identify Web 2.0 companies are shown in **Table 4**. O’Reilly suggested to test against Web 2.0-claiming companies.

They are all valid points on business model engineering. In this paper, the author tries to find fits between this list of Web 2.0 competencies with groupware and network service research literature.

(1) services:

The web as platform is undeniable trend with web services. However, it should be noted that the number of platforms is limited. The number of applications is

Table 4 Core Competencies of Web 2.0 Companies¹⁾

Services, not packaged software,
- with cost-effective scalability
Control over unique, hard-to-recreate
- data sources that get richer
- as more people use them
Trusting users as co-developers
Harnessing collective intelligence
Leveraging the long tail through
- customer self-service
Software above the level of a single device
Lightweight user interfaces,
- development models,
- and business models

far bigger than the number of platforms. Eon the platform implies the even smaller chance of success in the future Internet for start-up companies. The past groupware research's old agenda critical mass⁶⁾ is applied here.

(2) data sources:

In emergence of Google-API, we have to think about the fact that the only established big Internet companies can provide sophisticated APIs to the open public.

Considering the mash-up, map is an extraordinary example that fits in the universal requirements. It is an intuitively easy object usable in multiple contexts. It does not need much education because it was used in the human history even dated back 10000 years ago. Many other objects shared on the network do not have this comprehensiveness and easy-to-use characteristics. The past groupware agenda on learning curves are applied here.

Interface is another aspect of Web 2.0. Good software needs good interface design. The interface is important to parties to make mash-up when it provides a unique entrance to the uniquely valuable data. The external network effects on data resources are still to be covered.

(3) users ad co-developers:

Community computing overlaps with some of central agenda in groupware research. It should be noted that the everyday blog burned up many human beings. The persistent groupware agenda on imbalance of content creation cost and use cost are applied here. It is an exciting but exhausting experience. Continuous pressure from the online network is easily underestimated. The emergence of so-

cial network services reflects the shortcomings of the current open public Internet. However, the observation shows network-addiction is too heavy for common end users. Use of the API is fundamentally a programming with web services. The hardness from parallel and distributed development cannot be underestimated. The old groupware agenda on the non-applicability of intuitive design applies here. It can be compensated with Web 2.0 of ongoing-beta release approach, however, the difficulty of general API design persists. The organizational context gives some clues for user-contribution based information⁷⁾.

(4) collective intelligence:

Community and participation is a most interesting area for groupware and networked services researchers. There are two factors. First, the improvement of the end-user facility is one of the enabling factors. The wide-band connection with equipped camera and large-capacity memory helps initiation of multimedia content from end-user side. Second, the ubiquity of the Internet, high availability of end-to-end communication in 24-hour, enables the quick and dense communication among end-users. This facilitates diffusion and refinement process within the end-user community.

The success of syndication needs further analysis. When the mobile Internet became common, the click rate of the mobile Internet banners was high as the early PC internet banners were appreciated. When it became common, the people started to ignore the banners in either field. It is a critical factor whether the early hype continues to grow or just stays as a phenomenon with early adaptors. From the collaboration study's view, collaboration is a complicated and unpredictable process. In addition, the we-ness of the group is a key factor. Collective intelligence was on agenda in 1990's⁸⁾. It was restricted to model frameworks, due to the difficulty to quantitatively measure collective intelligence. Recently, data mining research gave more input to this field⁹⁾¹⁰⁾

- (5) long tail:
Long tail is one of the buzzwords. It is true that Google makes use of long-tail business in its Google AdSense with facilitating many small web sites with Google AdWords advertisement. However, advertisement is one of the rare cases where long tail works extremely well. When we talk about merchandising, we have to remember even amazon.com started to build a lot of regional distribution centers to secure their stocks. When you think about long tail ness of e-business, it is important to examine whether long tail ness really does not accumulate a major cost in the real world business scenes.

When we think about end-user customization, it should be noted that the end-user customization by end-users can be applied to only a small number of contexts. Customer support is one of the core competencies in the online business. When the end-user arbitrarily customizes the user interface or services, the customer support operation increases its difficulty. During the mobile Internet emergence in Japan, many start-up companies offered content adaptation in vain. One of the reasons of the low acceptance of content adaptation technologies was that the lack of trust between content providers and technology providers.

- (6) software on multiple devices:
The Japanese mobile Internet exhibits some of the interesting aspects with mobile Internet-unique or transitive ones. Web 2.0 on the ubiquitous environments needs consideration¹¹⁾.
- (7) lightweight user interface:
The business model development part is unarguable. When the agile development is implemented with quick Internet feedbacks, it is crucial to think about development process and business models. This causes a significant jump in the groupware and networked services research and development.

6. Gap between networked services studies and Web 2.0

The author considers the following factors are

the major impacts on groupware and networked services research and development.

- (1) Network effect studies:
It was a central topic in the past 2 decades to study about network effects. However, we recognize that the network effect deeply impacts a wide range of technical and business development effects. Web 2.0 exposes it in development process, business model process, content creation process, and user interface customization process. Web 2.0 deals with n when dealing with groups, but the n is more dynamic, more multi-faceted, with more interchangeable roles. In 1980's, we saw a lot of modeling in organizational computation¹²⁾. It was followed by business process reengineering¹³⁾. Workflow modeling followed in 1990's¹⁴⁾. However, the interactions in 2000's in Web 2.0 need a next stage framework to capture. The commitment is created in a more social and complicated manner. These factors need a methodology how to encapsulate and evaluate them. During the network evolution, *network computing* evolves. In the early days, the group, the task, and the interactions were fixed and closed. Research struggled with network limitations. Now, with the ubiquity, *network computing* starts to gain the new semantics, deeply embedded in the real life.

- (2) Socialization of Technology:
In the past, the conflicts between a society and a technology were captured as one between different natures. We witness the technology penetrates deeply in the daily life, social life and business model development. There could be multiple relations between a society and a technology. Technology itself can be remixed and mash-up-ed with new socialization process. People learned a lot during 1990's. They are equipped with high bandwidth, richer content, end-user contributions, and powerful search engines. When people reach certain Internet literacy level, the whole landscape of technology socialization is impacted. Task was well defined and closed in a group in the models in 1990's. What is a unit of tasks

in Web 2.0-enhanced interactions in both content production and consumption is a challenging research topic. Also, privacy and other social issues give another highlight¹⁵⁾.

The gap between collaboration studies and Web 2.0 is attributed to the following aspects:

- Lack of framework,
- Lack of business model engineering, and
- Lack of methodologies.

The lack of framework is the gap between technology-oriented research and Web 2.0-like technology/business model synergy ones. The networked effect of services was under-covered. The followings list some of the underlying frameworks:

- network effect: There is no network effect model to consider the open-ended participation and contribution
- motivation model in Web 2.0: It is important how Web 2.0 models attract different levels of participants and contributors
- platform/service diffusion model: In the legacy studies, service diffusion and technology diffusion meant the identical things. Now we have to distinguish technology/platform/service diffusions
- social design model: grand design of social relationship with the considerations of networks and Web 2.0 business models

The research was focused only when the component was well defined like collaborative filtering¹⁶⁾. Recently, a large-scale data mining research dealt with social networks¹⁷⁾⁹⁾¹⁰⁾¹⁸⁾.

The lack of business model engineering is the gap between Web 2.0-based software business shift and the current software development-based engineering. One of the major impacts of Web 2.0 is how to gain returns from the massive software development. Web 2.0 releases major efforts for application development to the end-user contributors and external resources using open interfaces. This is a fundamental aspect and significant impact on networked service research, however, the research field is far behind. The followings list some of the research agenda:

- network and business model fits model: to identify fits between network cost and business models
- platform business model: to identify the evolution and dynamism of platform build-

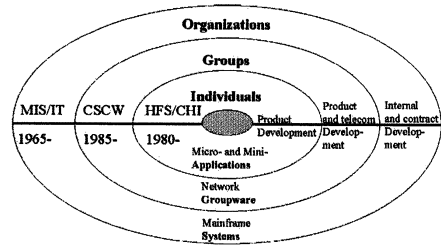


Fig. 1 Development and Research Context¹⁹⁾

ing business models

- fits model in networked stages and business model stages: to identify the fits between service stage and business models
- aggregation business model: to identify the factors driving aggregation business model in the approaching-null network costs

Software development is impacted by network evolution. Ubiquity of networking represents a fundamental departure of a legacy waterfall-based paradigm of software engineering. From this fact, the software engineering research itself needs a complete reconsideration.

The lack of methodologies is the gap between loosely coupled social network and the current laboratory methodologies. It should be noted that the socially constructed technology-augmented network is more difficult to analyze than those on the open public or organizational ones. The past groupware and networked services research focused *size*, as an important design dimension. However, the network effect was captured either in a linear manner or in a quantitative manner (individual, group, mass-public⁶⁾). Can we model the Web 2.0-empowered interactions in the model outlined in Fig. 1? It could be difficult. The complicated dynamics in the Web 2.0 interactions like remixing, mashup and user-contributed content needs further dimensions to capture their behaviors.

The method for observation was strictly quantitative or based on ethno-methodology. We have to examine these methodologies used in the literature can be applied to the different types of groups which emerge in the current network society. Their interactions are different from public interactions or interactions in the legacy organizations. The research agenda include:

- macro-methodologies for social network services: a methodology to analyze social networks, to analyze technology-augmented social network dynamism over time, and impacts on real-world human networks by the social network services
- methodologies for social studies for individual groups in a social network service: a methodology to identify role models and their transitions, or to identify a role model for a user using multiple social network services
- micro-methodologies to analyze the human motivations and social factors on the social networks

7. Conclusion

Web 2.0 gives a new perspective in the service engineering in the Internet. It follows the broadcasting-personalized-socialized trend in the communication media evolution. However, the careful analysis in the Web 2.0 aspects exposes the anomaly of Web 2.0. The author discussed implicit constraints and challenges in Web 2.0 design patterns. Also, the author presented the groupware and networked services issues exposed in Web 2.0 emergence. The author discussed the fits between the web 2.0 competences and groupware and networked service literature. This gives an implementation of unexplored research fields with many opportunities and business implications.

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